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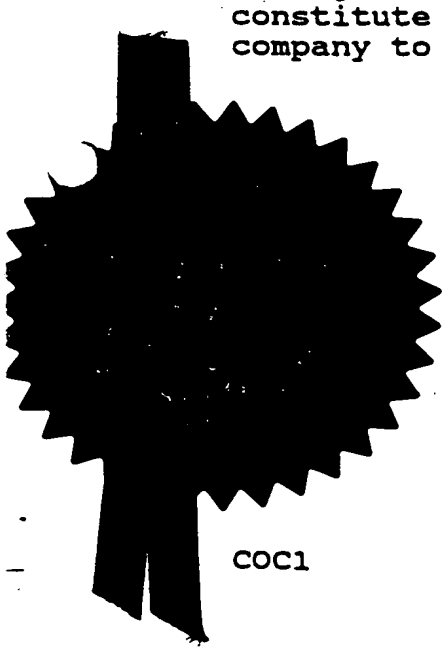

Signed M.J. Russell

Dated 25. 9. 95.

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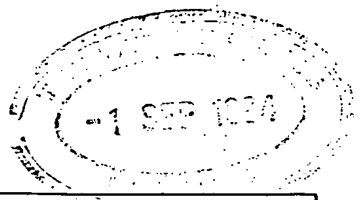

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-6SEP'94#00408272 PAT 1 77 UC 25.00

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A24862

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The Patent Office — Request for grant of a Patent

Form 1/77

Patents Act 1977

❶ Title of invention

1 Please give the title of the invention NAVIGATION INFORMATION SYSTEM

❷ Do not give trading styles, for example, 'Trading as XYZ company', nationality or former names, for example, 'formerly (known as) ABC Ltd' as these are not required.

❷ Applicant's details

☒ **First or only applicant**

2a If you are applying as a corporate body please give:

Corporate name

BRITISH TELECOMMUNICATIONS public limited company

Country *(and State of incorporation, if appropriate)* ENGLAND

2b If you are applying as an individual or one of a partnership please give in full:

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Forenames

2c **In all cases**, please give the following details:

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Yes [X] No [ ] ➡ ***go to 3b***

⬇ ***please give details below***

Agent's name LIDBETTER, TIMOTHY GUY EDWIN

Agent's address

BT GROUP LEGAL SERVICES
INTELLECTUAL PROPERTY DEPARTMENT
151 GOWER STREET
LONDON

Postcode WC1E 6BA

Agent's ADP number 17095001

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❹ Reference number

4 Agent's or applicant's reference number *(if applicable)* A24862

❺ Claiming an earlier application date

5 Are you claiming that this application be treated as having been filed on the date of filing of an earlier application?

Please mark correct box

Yes ☐ No ☒ ➡ ***go to 6***

↓

please give details below

❑ number of earlier application or patent number

❑ filing date

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Please give the date in all number format, for example, 31/05/90 for 31 May 1990.

6 If you are declaring priority from previous application(s), please give:

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❼ Inventorship

7 Are you (the applicant or applicants) the sole inventor or the joint inventors?

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❽ *Please supply duplicates of claim(s), abstract, description and drawing(s).*

❽ Checklist

8a Please fill in the number of sheets for each of the following types of document contained in this application.

Continuation sheets for this Patents Form 1/77			
Claim(s)	9	Description	~~10~~ 11
Abstract	1	Drawing(s)	

8b Which of the following documents also accompanies the application?

Please mark correct box(es)

Priority documents *(please state how many)*	
Translation(s) of Priority documents *(please state how many)*	
Patents Form 7/77 – Statement of Inventorship and Right to Grant *(please state how many)*	
Patents Form 9/77 – Preliminary Examination/Search	
Patents Form 10/77 – Request for Substantive Examination	

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❾ Request

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Date 1 September 1994 (day month year)

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NAVIGATION INFORMATION SYSTEM

This invention relates to navigation information systems. It is particularly suitable for use with road vehicles, but other applications are possible and are discussed below.

Navigation of a vehicle through a complex road network is a difficult task. Large amounts of fuel and time are wasted as a result of drivers getting lost or using an inefficient route. Accidents can also be caused by drivers attempting to read maps or complex road signs and losing concentration on the road ahead. Moreover, a driver may choose an inefficient route as a result of using an out-of-date map.

An additional problem can occur even if a driver knows a route to his or her destination. That route may be congested or blocked as a result of accidents or maintenance work, so that an alternative route would be more efficient.

Several proposals have been made for automated guidance systems. In one such proposal a vehicle-borne system has a navigation computer and a geographical information system which is essentially a digitised map stored on a CD-ROM. The system gives the driver information and guidance by screen and/or speech display. Real-time data is broadcast over a radio network to update fixed information held on the geographical information system.

The guidance service provider collects statistical traffic flow data from all equipped vehicles, from which traffic congestion predictions can be made which are fed into the real-time data to be broadcast.

Such a system would be very expensive. Each vehicle requires a navigation computer and geographical information system. The geographical information system requires periodic updating, which requires new disks to be distributed to subscribers from time to time. Even so, the geographical information system will only be accurate up to its last update.

The complex vehicle-borne equipment involved is estimated to cost in the region of £1000. The system is complex to operate, and could only be safely operated by the driver whilst the vehicle is stationary. Moreover, a broadcast channel needs to be allocated for the updating service.

In an alternative proposal short-range roadside beacons are used to transmit guidance to passing vehicles equipped with simple receivers. . The guidance instructions relevant to the chosen destination are selected by in-vehicle equipment. The system allows instant updating of the guidance instructions and simpler in-vehicle equipment, but requires vast capital expenditure in roadside beacons.

According to a first aspect of the invention, there is provided a navigation information system comprising a communications system having a fixed part and one or more mobile parts, the fixed part including a data storage and data processing means for generating guidance information and transmitting it to the mobile part, and the mobile part including means for receiving said guidance information.

According to a second aspect of the invention, there is provided a navigation information system comprising a data storage means, means for receiving requests for guidance information, data processing means for processing requests for guidance information using data stored in the data storage means, and communications means for transmitting the generated guidance information to the source of the request.

According to a third aspect of the invention there is provided a mobile unit for a navigation information system, comprising means for generating a request for navigation information, means for transmitting said request over a telecommunications link to a cooperating database unit, means for receiving said navigation information over the telecommunications link, and means for processing said received navigation information.

According to a fourth aspect of the invention, there is provided a method for providing navigation information to

mobile units comprising the steps of storing navigation data in a fixed unit, transmitting a request for navigation guidance for a mobile unit to the fixed unit, generating location information relating to the mobile unit, generating guidance information on the basis of the stored data, location information and the request, and transmitting the guidance information from the fixed unit to the mobile unit.

By putting the intelligence in the fixed part of the system considerable improvements can be made over the prior proposals. Firstly, there is no need to distribute map updates to subscribers because the data is held centrally. New roads can be added to the system at the instant they are opened. Total capital expenditure is minimised since all users share the same database. Moreover, the computing resources are used more efficiently, because an in-vehicle system spends most of its time inactive but a centralised system can be time-shared. Furthermore, with knowledge of the routes being planned, a better prediction of demand and hence congestion can be built up. In the limit, this can become a closed system which is more stable than an autonomous route-planning system in which users' systems do not take account of the routes planned for other users. Moreover, the system allows the use of public cellular radio data services on an individual dial-up basis, providing a simple mechanism for billing and avoiding the need for a broadcast channel (which would be needed throughout the coverage area whether any individual cell had a subscriber or not).

The communications system is preferably a cellular radio system.

The system preferably includes means for identifying the location of the mobile part. This may be by means of dead reckoning from a known start point, using an inertial navigation system or distance and direction measuring devices such as a compass and an odometer. In a preferred arrangement the location of the mobile part is determined by a radio

location system such as a satellite positioning system, or means associated with the cellular radio system.

The fixed part may have means for interrogating the location-identifying means of the mobile part. In this way the fixed part can then identify the starting point for the guidance instructions, even if the driver does not know his whereabouts.

In a preferred arrangement, the fixed part and the mobile parts each have a satellite navigation system receivers, and the positions of the mobile parts as measured by the satellite navigation system are compared with those of the fixed part as measured by the satellite navigation system. The position of the fixed part provides a reference measurement which allows the position of the mobile part to be determined with greater accuracy than is possible by direct measurement using the satellite system alone.

The fixed part of the system may further comprise means for generating and maintaining digital maps based on the position measurements of the mobile parts. If the mobile parts are vehicles, these position measurements should identify the locations of roads, and an indication of their traffic density. The maps will be automatically updated as new roads are built or routes are diverted.

The system may also comprise means for determining when a mobile unit enters a predetermined region, and means for transmitting a message in response to the mobile unit entering the predetermined region. This message may be the next instruction to the driver delivered as he approaches the junction at which he is required to turn. If the driver enters a region which is not on the route chosen by the system, an error message can be transmitted. The message may be transmitted to a user other than the mobile unit, for instance in order to monitor the whereabouts of valuable cargoes or of personnel working away from a base.

The data stored in the data storage means may be updated, for example in response to changing traffic conditions, accidents, or highway maintenance. The system may

include means for identifying the mobile units to which the updated data are applicable, and transmitting amended instructions over the communications system to said mobile parts.

Preferably the fixed part has a plurality of servers and means for allocating one of the servers to each mobile part requiring service. In practice only a very small number of mobile units will require service at any given time, so this allows the computing resources of the fixed part to be used most efficiently, and the system can support many more mobile units than it has servers. This is in contrast to the prior art system discussed above, in which each mobile unit requires a dedicated computer carried on board, which is only used for a fraction of the time. Moreover, all the servers can use a common road-use database, which can use the information on routes it has planned for mobile users to build a prediction of future road use status, such as likely congestion points, and build this into its guidance instruction process. For example the system can be arranged such that it does not direct more than a predetermined number of users to use a particular stretch of road at a particular time, and finds alternative routes for any users who would otherwise be directed along that road at that time. In this way the system can predict likely congestion points and take pre-emptive action.

The mobile part may include guidance instruction means programmable from the fixed part over the communications link.

For some applications the vehicle may be controlled directly in response to the guidance information received over the communications link. However, for use on the public highway, it is preferable that the guidance information controls display means, which may be visual or audible or both, to indicate to a driver the direction to take.

The guidance information means may be programmable from the fixed part over the communications link, either automatically or by a human operator. The guidance

instruction means may include a speech synthesiser, which may be located in the fixed part, transmitting voice messages to the user over the communications system, or may be located in the mobile unit and controlled by data messages from the fixed part. The former arrangement allows the mobile unit to be simplified, whilst the latter arrangement requires a smaller signalling load.

In the described embodiment the mobile part is in a vehicle, but it may be a hand-held device for guiding a pedestrian. In one form, the mobile part may be a conventional mobile cellular radio unit.

An embodiment of the invention will now be described by way of example with reference to the drawing, which shows one mobile part and the fixed part of a navigation information system embodying this invention.

Variations on the embodiment depicted will also be described below, in which certain elements are modified or replaced.

The mobile part comprises a mobile telephone 1 having an audio output 2, an audio input 3 and a radio antenna (transmit/receive) 4. The output 2 is connected to a decoder 5 to translate Dual-Tone Multi-Frequency (DTMF) signals received by the telephone 1 into data which is fed to an interface controller 6. The interface controller 6 also receives input from a GPS (Global Positioning System) satellite receiver 7. The interface controller transmits data to a DTMF encoder 8 which generates tones to be fed to the audio input of the mobile telephone. The audio output 2 and input 3 also include a loudspeaker 9 and microphone 10 respctively, to allow the telephone to be used for speech.

The fixed part comprises an interface with the cellular telephone network 11, connected through a DTMF decoder 12 and encoder 13 and a controller interface 14 to a computer 15. The computer 15 comprises a number of servers 16, one of which is allocated to each active mobile unit. The servers 16 have access to a geographical database 17, and a database of standard messages 18. The geographical

database 17 is updatable through updating input 19. The computer may transmit messages either in DTMF code, using the encoder 12, or may generate voice messages which are transmitted through a voice output 20 to the cellular network 11.

DTMF signals are used to telemeter the position of the vehicle to the computer 15 which can then act as a server to offer information and guidance either to the vehicle or to a third party on demand.

In a digital cellular network digitised data can be transmitted. However for an analogue cellular radio network DTMF is an ideal signalling medium when only short status messages are required to be transmitted. It can survive in the severe signal fading and noise of the mobile environment which frequently precludes the use of fast phase or frequency shift data modulation. Another advantage is the ability to co-exist with speech. For example a DTMF data burst containing vehicle position data could be sent at the start of a call and perhaps every 2 minutes during the call.

GPS (Global Positioning System) satellite navigation receivers are now becoming very cheap and are available with a serial data output. The encoder 8 takes the latitude and longitude data in the form: degrees, minutes, seconds, decimal seconds, and translates the numbers into DTMF tone-pairs. There may be scope for data reduction since only one decimal digit of degrees each would be needed for both latitude and longitude to cover a territory the size of the United Kingdom or Germany. The basic position message would therefore consist of 12 decimal digits which can be transmitted by DTMF in less than 2 seconds. The cellular telephone would couple this audio signal into its speech input path. This is easy to do with a hands-free vehicle-mounted cellular telephone since the microphone lead is accessible or alternatively, a small transducer can be mounted next to the microphone 10.

A DTMF receiver 5 coupled to the loudspeaker 9 (again acoustically or electrically) decodes supervisory data coming

back from the server 16 to acknowledge the reception of location messages. If no acknowledgement is received by the DTMF unit then the data message is repeated.

Other simple coded DTMF messages can also be conveyed to indicate emergencies, provide simple driver indications (e.g. illuminated arrows to turn left or right) or trigger synthetic speech generated by another sub-system in the vehicle.

The fixed end of the system comprises a DTMF decoder 12 and encoder 13 coupled to a serial data interface 14 of the server computer 15. This computer, on the one hand, can call the mobile part which will auto-answer and then provide its location using the DTMF signalling system or on the other hand can receive an unsolicited call, which would include the DTMF encoded identity of the mobile unit and would also provide the vehicle location using the DTMF interface 6.

When the computer 15 receives a location message, it stores the location as a latitude and longitude and then searches its database for that location being within the area defined by a polygon of relevance. Polygons of relevance are defined in the database by co-ordinates of latitude and longitude and have attributes associated which define messages which can be passed to mobile subscribers within the area defined. When a DTMF location message has co-ordinates which fall inside the area of a polygon of relevance the associated messages are then passed to the mobile part as a computer synthesised speech message, a DTMF coded message (to activate other subsystems) or as a high speed conventional data message.

The system is operated as follows:-

At start of a journey the driver requests service by activating a pre-dial control on the telephone 1. This control is transmitted to the control interface 14 over the telephone network 11. The control interface 14 then allocates a free server 16 to answer the call and interrogate the vehicle GPS receiver 7 to determine its geographical position.

The server 16 then captures the driver requirements which includes the current position and any fixed subscriber-specific information such as the type of vehicle, which may be relevant for the route to be selected e.g. because of height or weight restrictions. The driver may encode his other requirements (in particular his destination) by using the telephone keypad in response to voice prompts. However, in a preferred arrangement the call is presented to a human operator for the data capture phase. This is more user-friendly, and also allows the driver to speak his requirements, keeping his hands free for driving.

The operator then remotely programs the in-vehicle interface 6 and instigates the generation by the computer server 16 of voice given directions and instructions to the driver.

In an alternative arrangement the speech generation subsystem can be carried on board the vehicle. This subsystem has various stored speech commands which are controlled from the in-vehicle interface 6 in response to commands transmitted from the fixed part. This arrangement reduces the signalling traffic required over the radio link 11, but increases the complexity of the in-vehicle equipment.

As the driver follows the route further instructions can automatically be sent and the driver can be alerted if the route has been left or if any new traffic problems have been detected that will affect the individual driver. The system is arranged such that when the system locates a mobile unit entering an area corresponding to a polygon of relevance having a message defined for it, for example the next turn instruction, or an error message if the mobile unit has gone off the selected route, that message is transmitted. The system may also be arranged to transmit messages to users other than the mobile unit in question, for example to monitor the progress of valuable cargoes.

At any time the driver can call the human operator if service requirements change or additional help is needed.

A central database is used and thus all vehicle movements are known. Traffic models can be used to optimise traffic flows and reduce journey times. The system can also ensure that it does not itself cause congestion, by limiting the number of vehicles it instructs to use the same road at the same time.

With use the data flowing though the system will allow it to "learn" more of the road system's characteristic congestion behaviour. In addition, the system can generate digital road maps automatically, based on the position measurements of vehicles using the roads.

The example above includes an illustration of how messages can be provided over an analogue communications system. Alternatively, messages could be passed over an associated packet data system such as the Short Message Service (SMS) of GSM (Global System for Mobile Communications).

Another enhancement to the basic system would be to use the Global Positioning System to measure position relative to a fixed point. In this method, the service provider provides a small number of fixed reference receivers to generate correction data. Since the position of these receivers is known, they can be used to correct errors generated by the small inaccuracies generated by satellite systems as a result of instabilities in the orbits of the satellites.

Alternative arrangements for identifying and updating the mobile part's location may be used, which do not rely on a satellite receiver. In one variant, a navigation system based on dead-reckoning may be used. In such systems the user identifies his initial location and the system measures the system's movement e.g. by magnetic bearing measurements, distance counters, and inertial navigation means such as gyrocompasses and accelerometers. Such systems are self-contained, but require knowledge of the starting point.

In another variant, a method of location may be used which relies on the propagation characteristics of the radio

systems used in the cellular system itself. Examples of such systems are disclosed in the Applicant's co-pending UK patent application no. 9416085.0 filed on 9th August 1994. This discloses the determination of the position of an object in radio communication with several antennas by comparing the signal strengths of the various radio links.

In one arrangement, three co-located directional antennas at 120° to each other detect the signal strengths of the mobile unit. The relative signal strengths are independent of distance or of any path losses, since these are the same for all three antennas, so a measurement of bearing angle can be determined. The position can be fixed by triangulation from two such base stations, or by measuring range using the time delay for a signal to be returned to the base station from the mobile unit. In an alternative arrangement a template is created for comparative signal strengths for several neighbouring base stations for a number of locations throughout the coverage area.

In this arrangement the location measurement may be made by the fixed system. This allows the mobile part of the system to be embodied by a conventional cellular telephone, with inputs being provided by speech, or by DTMF tones generated by the keypad, and instructions to the user being transmitted by voice commands.

CLAIMS

1. A navigation information system comprising a communications system having a fixed part and one or more mobile parts, the fixed part including a data storage means and a data processing means for generating guidance information and means for transmitting the information to the mobile part, and the mobile part including means for receiving said guidance information.

2. A system as claimed in Claim 1, wherein the communications system is a cellular radio system.

3. A system as claimed in Claim 1 or 2, wherein the system includes means for identifying the location of the mobile part.

4. A system as claimed in Claim 3, wherein the mobile part has means for locating its position by dead reckoning.

5. A system as claimed in Claim 3, having means for locating the position of the mobile part by radio location.

6. A system as claimed in Claim 5, wherein the means for locating position is a satellite navigation system receiver.

7. A system as claimed in Claim 5 or 6, wherein the means for locating position includes means for identifying the location of the mobile part in relation to elements of the fixed part of the communications system.

8. A system as claimed in any of Claims 3 to 7, wherein the fixed part has means to interrogate a location-identifying means forming part of the mobile part.

9. A system according to claim 7 or 8, wherein the fixed part and the mobile parts each have a satellite navigation

system receiver, comprising means for comparing the positions of the mobile parts as measured by the satellite navigation system with that of the fixed part as measured by the satellite navigation system.

10. A system as claimed in any of claims 3 to 9, further comprising means for generating and maintaining digital maps based on the position measurements of the mobile parts.

11. A system according to any of claims 3 to 10, further comprising means for determining when a mobile unit enters a predetermined region, and means for transmitting a message in response to the mobile unit entering the predetermined region.

12. A system according to claim 11, wherein the message is transmitted to a user other than the mobile unit.

13. A system according to any preceding claim, further comprising means for updating the data storage means, means for identifying mobile parts to which the updated data are applicable, and means for transmitting such data over the communications system to said mobile parts.

14. A system according to any preceding claim, wherein each mobile part has means for requesting service, and wherein the fixed part has a plurality of servers and means for allocating one of the servers to each mobile part requiring service.

15. A navigation information system according to claim 14, wherein all the servers use a common road-use database, the road-use database being arranged to use the information on routes planned to build a prediction of future road use status.

16. A system according to any preceding claim, further comprising means for controlling a vehicle in response to the guidance information received over the communications link.

17. A system according to any of claims 1 to 16, further comprising means for displaying the guidance information received over the communications link.

18. A system according to claim 17, wherein the display means provides an audible indication.

19. A system according to any preceding claim, wherein the mobile part includes guidance instruction means programmable from the fixed part over the communications link.

20. A system according to claim 19, wherein the fixed part comprises input means operable by a human operator to transmit instructions to the guidance instruction means.

21. A system according to claim 19 or 20, wherein the guidance instruction means includes a speech synthesiser.

22. A system according to any preceding claim, the mobile part forming part of a vehicle.

23. A system according to any preceding claim, the mobile part being a hand-held device.

24. A navigation information system comprising a data storage means, means for receiving requests for guidance information, data processing means for processing requests for guidance information using data stored in the data storage means, and communications means for transmitting the generated guidance information to the source of the request.

25. A navigation information system as claimed in Claim 24, wherein the communications means is a cellular radio system.

26. A navigation information system according to claim 24 or 25, comprising means for identifying the location of co-operating mobile units.

27. A navigation information system according to claim 26, further comprising means to interrogate location identifying means of a cooperating mobile unit to determine its position.

28. A navigation information system as claimed in claim 26 or 27, including a fixed satellite navigation system receiver, and means for comparing the position of the co-operating mobile units as measured by the satellite navigation system with the position of the fixed satellite navigation receiver.

29. A system as claimed in any of claims 26 to 28, further comprising means for generating and maintaining digital maps based on the position measurements of the mobile parts.

30. A system according to any of claims 26 to 29, further comprising means for determining when a mobile unit enters a predetermined region, and means for transmitting a message in response to the mobile unit entering the predetermined region

31. A system according to claim 30, wherein the message is transmitted to a user other than the mobile unit.

32. A navigation information system as claimed in any of claims 24 to 31, further comprising means for updating the data stored in the data storage means, means for identifying mobile units to which the updated data are applicable, and means for transmitting such data over the communications system to said mobile units.

33. A system according to any of Claims 24 to 32, comprising a plurality of servers, and means for allocating one of the servers to each cooperating mobile unit requesting service.

34. A navigation information system according to claim 33, wherein all the servers use a common road-use database, the road-use database being arranged to use the information on routes planned to build a prediction of future road use status.

35. A system as claimed in any of claims 24 to 34, comprising input means operable by a human operator to generate guidance instructions.

36. A system as claimed in any of claims 24 to 35, wherein the guidance instructions are generated by a speech synthesiser.

37. A mobile unit for a navigation information system, comprising means for generating a request for navigation information, means for transmitting said request over a telecommunications link to a cooperating database unit, means for receiving said navigation information over the telecommunications link, and means for processing said received navigation information.

38. A mobile unit as claimed in Claim 37, further comprising means for generating and transmitting information on the location of the mobile unit.

39. A mobile unit as claimed in Claim 38, wherein the means for generating location information includes a radio receiver.

40. A mobile unit according to Claim 39 comprising a radio receiver for receiving location information from a satellite positioning system.

41. A mobile unit as claimed in Claim 38, wherein the means for generating location information comprises a system for measuring the movement of the mobile unit.

42. A mobile unit according to Claim 41, wherein the means for measuring the movement of the mobile unit comprises an inertial navigation system.

43. A mobile unit according to Claim 41 wherein the means for measuring the movement of the mobile unit includes a distance measuring device and a direction measuring device.

44. A mobile unit according to any of Claims 37 to 43 comprising guidance instruction means programmable from instructions received over the communications link.

45. A mobile unit according any of Claims 37 to 44, wherein the processing means comprises means for controlling a vehicle in response to the guidance information received over the communications link.

46. A mobile unit according to any of Claims 37 to 45, wherein the processing means comprises means for displaying the guidance information received over the communications link.

47. A mobile unit according to Claim 46, wherein the display means is an audible indication.

48. A mobile unit according to claim 47, wherein the display means is a speech synthesiser.

49. A mobile unit according to any of claims 37 to 48, forming part of a vehicle.

50. A mobile unit according to any of Claims 37 to 48, being a hand-held device.

51. A method for providing navigation information to mobile units comprising the steps of storing navigation data in a fixed unit, transmitting a request for navigation guidance for a mobile unit to the fixed unit, generating location information relating to the mobile unit, generating guidance information on the basis of the stored data, location information and the request, and transmitting the guidance information from the fixed unit to the mobile unit.

52. A method as claimed in Claim 51, wherein the information is transmitted over a cellular radio system.

53. A method as claimed in Claim 51 or 52, wherein the generation of the location information is performed by the mobile unit.

54. A method as claimed in Claim 53, wherein the mobile unit identifies its position by dead reckoning.

55. A method as claimed in Claim 53, wherein the position of the mobile unit is identified by a radio location method.

56. A method as claimed in Claim 55, wherein the mobile unit identifies its position by means of a satellite navigation system.

57. A method as claimed in claim 55 or 56, wherein the position of the mobile unit is measured by elements of the fixed part of the communications system.

58. A method according to any of Claims 53 to 57, wherein the fixed unit interrogates the mobile unit to identify its location.

59. A method as claimed in claim 56, wherein the position of a fixed part of the communications system is measured by the satellite navigation system, and the position is compared with the position of the mobile part as measured by the satellite navigation system to determine the position of the mobile part in relation to the fixed part.

60. A method according to any of Claims 51 to 59, including the steps of generating and maintaining digital maps based on the position measurements of the mobile units.

61. A method according to any of claims 53 to 60, wherein when a mobile unit enters a predetermined region a message is transmitted.

62. A method according to claim 61, wherein the message is transmitted to a user other than the mobile unit.

63. A method as claimed in any of Claims 51 to 62 comprising the further steps of the updating the data storage means, identifying the mobile units to which the updated data are applicable, and transmitting such data over the communications system to said applicable mobile parts.

64. A method according to any of claims 51 to 63, wherein the mobile part requests service and the fixed part allocates one of a plurality of servers to the mobile part in response to such request.

65. A method according to claim 64, wherein all the servers use a common road-use database, wherein the road-use database uses the information on routes planned to build a prediction of future road use status.

66. A method according to any of Claims 51 to 65, comprising the further step of controlling a vehicle in response to the guidance information received over the communications link.

67. A method according to any of Claims 51 to 65, further comprising the step of displaying the guidance information received over the communications link.

68. A method according to Claim 67 including the step of providing an audible indication of the guidance information.

69. A method according to claim 68, wherein the audible indication is generated by a speech synthesiser.

70. A method according to claim 69, wherein the speech synthesiser is in the fixed part.

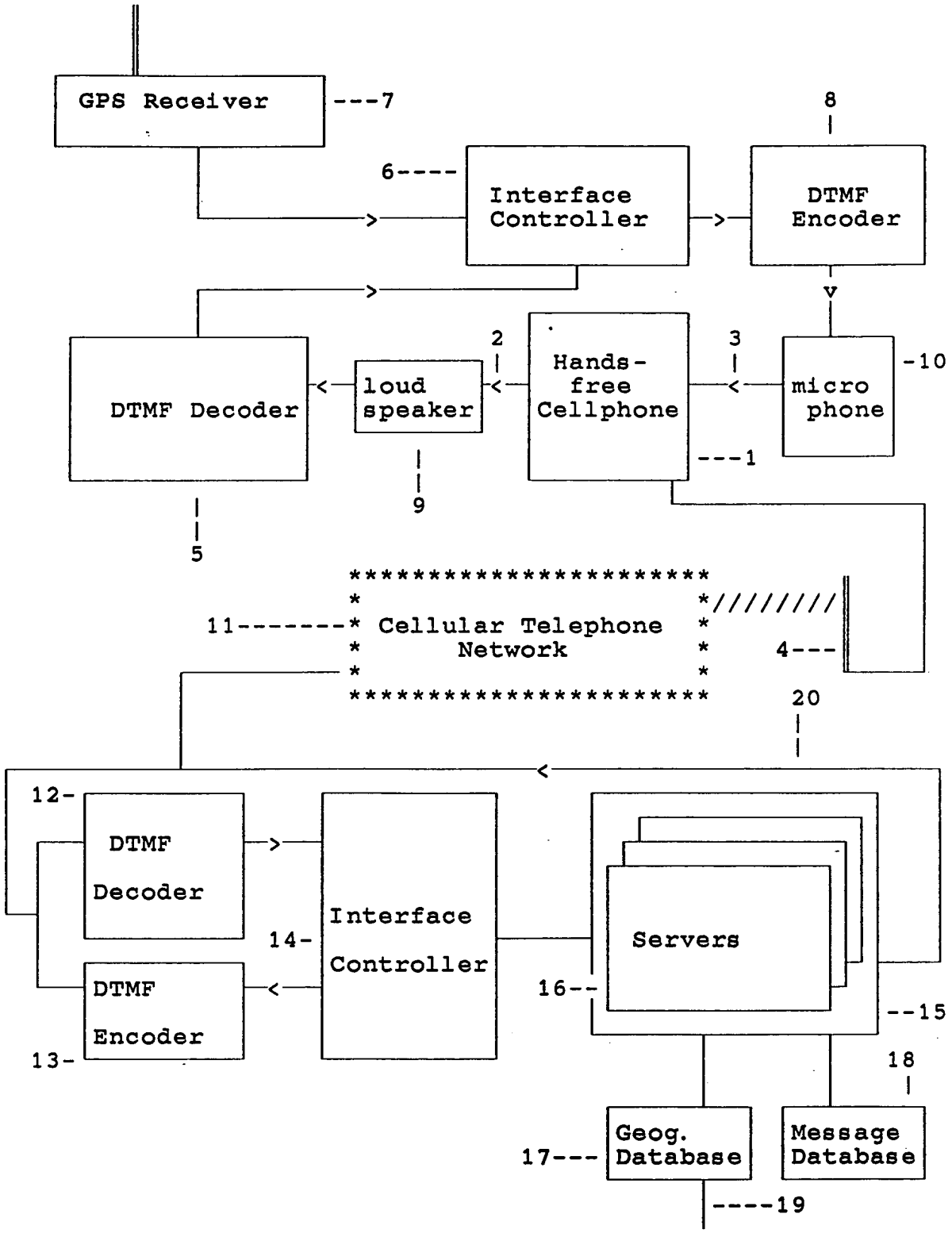
71. A method according to claim 70, wherein data is transmitted from the fixed part to the mobile part, and wherein the data is converted to synthesised speech by the mobile part.

72. A method according to any of Claims 51 to 61, the mobile part forming part of a vehicle.

73. A method according to any of Claims 51 to 72, the mobile part being a hand-held device.

ABSTRACT (the figure)

A navigation information system comprises a communications system having a fixed part (11 to 20) and at least one mobile part (1 to 10), the fixed part including a data storage and processing means 15 for generating guidance information and transmitting it to the mobile part. By locating most of the complexity with the service provider, in particular the navigation computer 15 and geographical database 17, the system can be readily updated and the capital cost of the in-vehicle system, which in its simplest form may be a standard cellular telephone 1, can be minimised. The user makes a request for guidance information, and the system, having determined the user's present location, then transmits instructions to the user. The user's present location can be determined by means such as a Global Positioning (satellite) System 7.


GPS Receiver
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8
6----
Interface Controller
DTMF Encoder
DTMF Decoder
2
loud speaker
Hands-free Cellphone
3
micro phone
-10
---1
9
5
11-------* Cellular Telephone Network *
4---
20
12-
DTMF Decoder
14-
Interface Controller
Servers
16--
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DTMF Encoder
13-
18
17---
Geog. Database
Message Database
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